AIR CONDITIONING

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AIR CONDITIONING

21-1. AIR CONDITIONING SYSTEM - DESCRIPTION

The air conditioning system for the TH-57 helicopter consists of a cabin ventilation/engine bleed air heating system and a refrigerant R134a vapor cycle cooling system. This system allows the pilot to control both heating and cooling for a comfortable aircraft cabin. Figure 21-1 shows an operational schematic of the Air Conditioning System.

The pilot's overhead control panel contains the bleed air heat OFF/MAX control valve. The instrument panel contains the cooling system ON/OFF switch, the fan OFF/LOW/HIGH switch, and a cabin cooling rheostat. The heating and cooling systems can be used simultaneously for cabin de-fogging.

21-2. HEATING SYSTEM

The heating system consists of a bleed air heater that is integrated into the aft evaporator distribution ducting and is pneumatically controlled. Bleed air from the engine is mixed with cabin air, as drawn through the aft evaporator distribution ducting. The heater assembly is located above the baggage compartment. A control valve on the pilot's overhead console controls the amount of heat delivered to the cabin.

21-3. COOLING SYSTEM

The cooling or air conditioning system, as designed and manufactured by Keith Products for the TH-57B & C helicopter, is a vapor cycle type cooling system using refrigerant R134a. The electrical portion of the system is operated using the aircraft 28 VDC electrical system and is operable in all normal flight modes. Air conditioning may be operated with the engine operating and the aircraft electrical system providing 28 VDC to the main buss.

The major components of the system (Figure 21-2) are the compressor, condenser assembly with blower, and two evaporator/cabin blower units. Refrigerant plumbing and electrical systems connect the major component to provide a closed loop system.

The following helicopters differ slightly from the rest of the fleet in that the components comprising the air conditioning system are located in different areas:

146/161695
142/161698
143/161699
144/161700
145/161701

The variables in the location of air conditioner system components is due to these aircraft being converted from an air cycle air conditioner to a vapor cycle system. The variations will be noted in the paragraph descriptions. Operation of the system is identical on all aircraft.

The compressor is mounted in the engine compartment and is driven by the tail rotor drive shaft accessory pulley via a "V" type belt. The compressor takes low pressure refrigerant gas and compresses it to a higher pressure and temperature.

The condenser is located behind the baggage compartment area and includes a condenser coil and blower. The condenser cooling air (ambient air) is drawn in through a cutout in the fuselage skin on the left side of the aircraft and passes through the condenser coil to remove heat from the system. After passing through the condenser coil, the air is exhausted to the outside through an exhaust duct located on the bottom of the aircraft.

Two evaporator/blower units are located within the helicopter interior. One evaporator, located aft of the rear passenger's seat, provides cooling airflow for the cabin area of the interior. Another evaporator is located forward of the instrument panel and provides cooling airflow to the flight crew through two panel mounted air outlets. Both evaporators are of a design wherein the cabin air is drawn into the evaporator coil and the fan then delivers the conditioned air to the cabin. This recirculating system continues to dry and cool the air each time it passes through the evaporator. Moisture removed from the air by the cold coil (condensate) is collected within the evaporator housing and is forced overboard. Each evaporator is equipped with a thermal expansion valve which

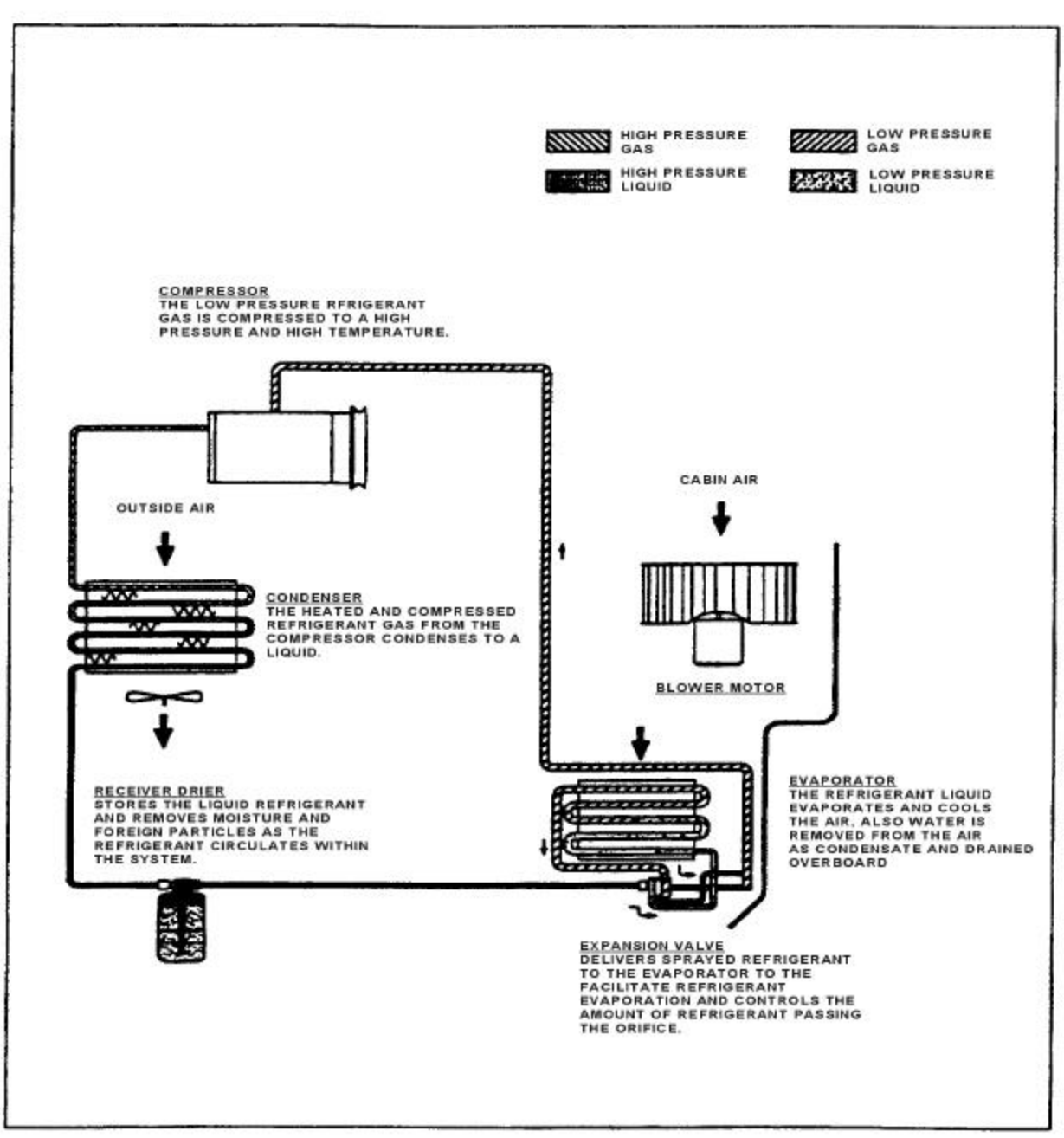
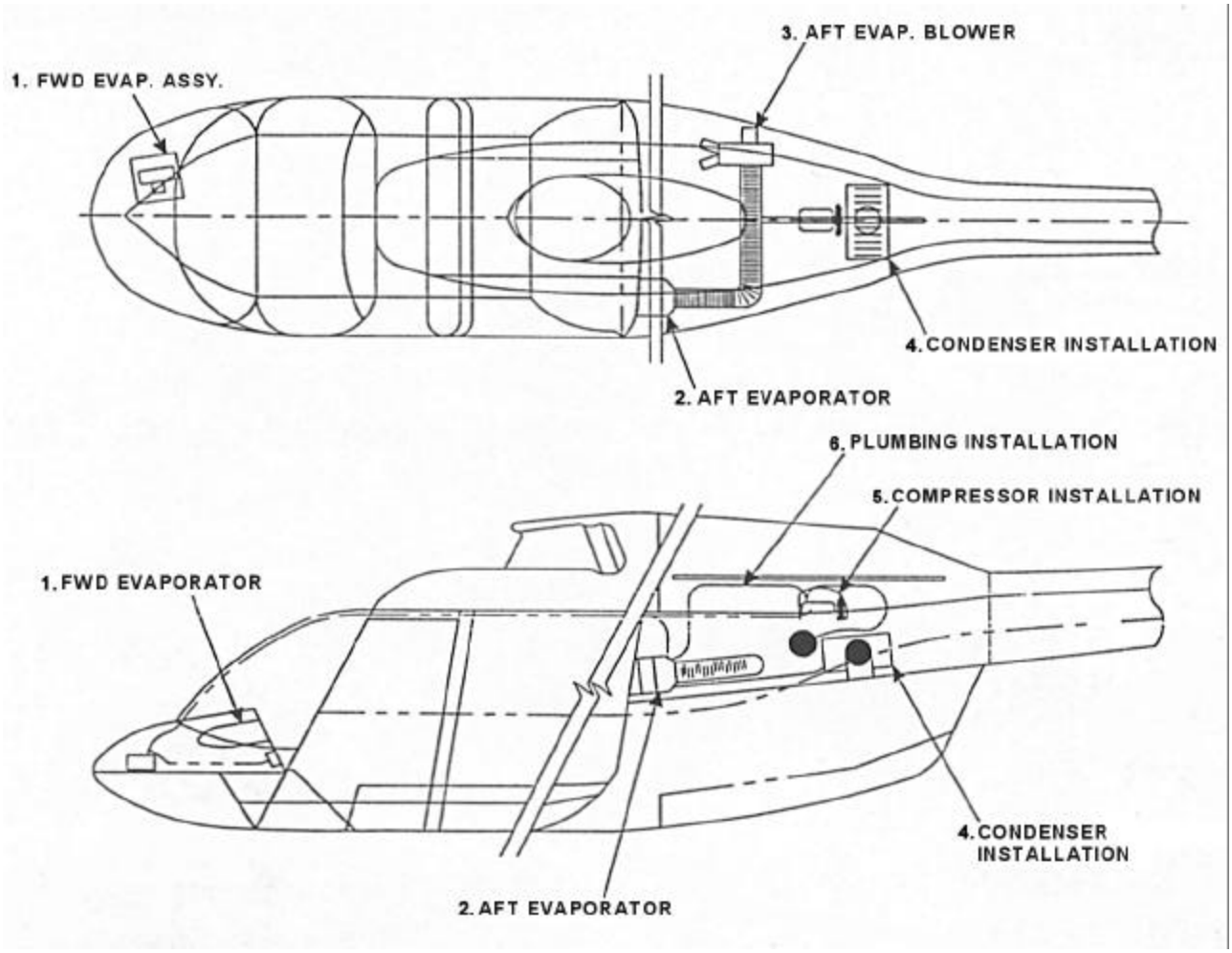


Figure 21-1. Air Conditioning Operational Schematic



1. **Fwd. Evaporator**
2. **Aft Evaporator**
3. **Aft Evaporator Blower**
4. **Condenser**
5. **Compressor**
6. **Plumbing Install**

Figure 21-2. Air Conditioning System General Arrangement

regulates the amount of refrigerant entering the coil to provide optimum cooling effect. The evaporator blowers can be operated in the "FAN" position to recirculate cabin air without cooling. Both blowers are operated from the same fan speed control.

The plumbing which connects the compressor, condenser and the evaporator consists of rubber based hoses with a nylon barrier or flexible nylon lined refrigerant hose. All fittings are “O-Ring” type or use flared connections with sealant on the fitting mating surfaces to prevent refrigerant leaks. The fittings used are swaged type fittings. Two R134a service valves are located at the compressor in the engine compartment. They are sized differently to avoid incorrect cross-connecting when gaining access to the plumbing for system recharging.

The electrical system allows operation of the electrical portion of the air conditioning system from either aircraft power, or from an active GPU during maintenance. Temperature control is accomplished through a rheostat to set desired cooling air temperature. Two temperature sensors, wired in series and located in the aft evaporator inlet, provides the input signal to the temperature controller. The temperature controller cycles the compressor clutch, as necessary, to achieve the selected cabin temperature. System safety features include an evaporator freeze switch that inhibits the compressor clutch when the evaporator air outlet temperature is cold enough to form condensate ice build up.

The entire air conditioning refrigerant loop is protected against over pressure conditions by two separate safety devices. The first device is a binary high/low pressure switch that activates in the event of an overpressure and is located in the engine compartment forward of the compressor. This switch will open at approximately 350 PSIG and will interrupt power to the compressor clutch at which point the system pressures will drop. The switch will also interrupt power to the compressor clutch under low pressure conditions. The second overpressure safety device is a fuse plug which will vent the system refrigerant safely overboard in the event of a system pressure in excess of 425 PSIG. It is located on the receiver/drier.

21-4. AIR CONDITIONING SYSTEM.

The air conditioning system consists of a vapor cycle air conditioner and a bleed air operated heater. Refer to paragraph 21-51 through 21-56 for heater description and maintenance procedures. The air conditioning system consists of the following components: A compressor installation is located on the engine firewall drain pan and driven by a belt and pulley arrangement attached to the aft end of the short tail rotor driveshaft in aft engine area. A condenser/blower installation is located aft of the baggage compartment. Openings on left side of helicopter, above baggage door allow air to be ingested into the coil and then exhausted overboard. The air-conditioning system is equipped with two evaporator assemblies, one located aft of the hat bin shelf area on left side and a forward evaporator and blower assembly located under the glareshield assembly and back of the right hand side of the instrument panel. Cabin air is drawn through a screened opening in avionics shelf and then through a plenun and into the evaporation coils. Condensation moisture is collected and drained overboard through a tube on right side of fuselage adjacent to the top access panel in baggage compartment. The blower serves a dual function by providing circulation air for the air conditioning and augmenting air flow when bleed air heating system is operating. The electrical installation consists of a switch panel located on instrument sub panel or center console. An electrical panel which contains the relays and temperature control is located on a shelf aft of the avionics shelf area. System circuit breakers are located in the overhead circuit breaker panel. The forward blower installation consists of dual forward blowers located on each side of the console. Air is ducted from under pilot and copilot seats forward to the blowers and up to the console mounted outlets.

21-5. SYSTEM OPERATIONAL DESCRIPTION.

When the system is operating, the compressor compresses freon gas which is routed to the condenser where cooling from the fan removes heat from the gas, condensing the gas into a liquid. The liquid is then stored in a receiver/dryer adjacent to the evaporator until it is used.

The freon is metered through the evaporator by the expansion valves at a rate which allows all the liquid to evaporate and return to the compressor at a reduced pressure. The cabin heat is absorbed from the air passing over the evaporator cooling fans.

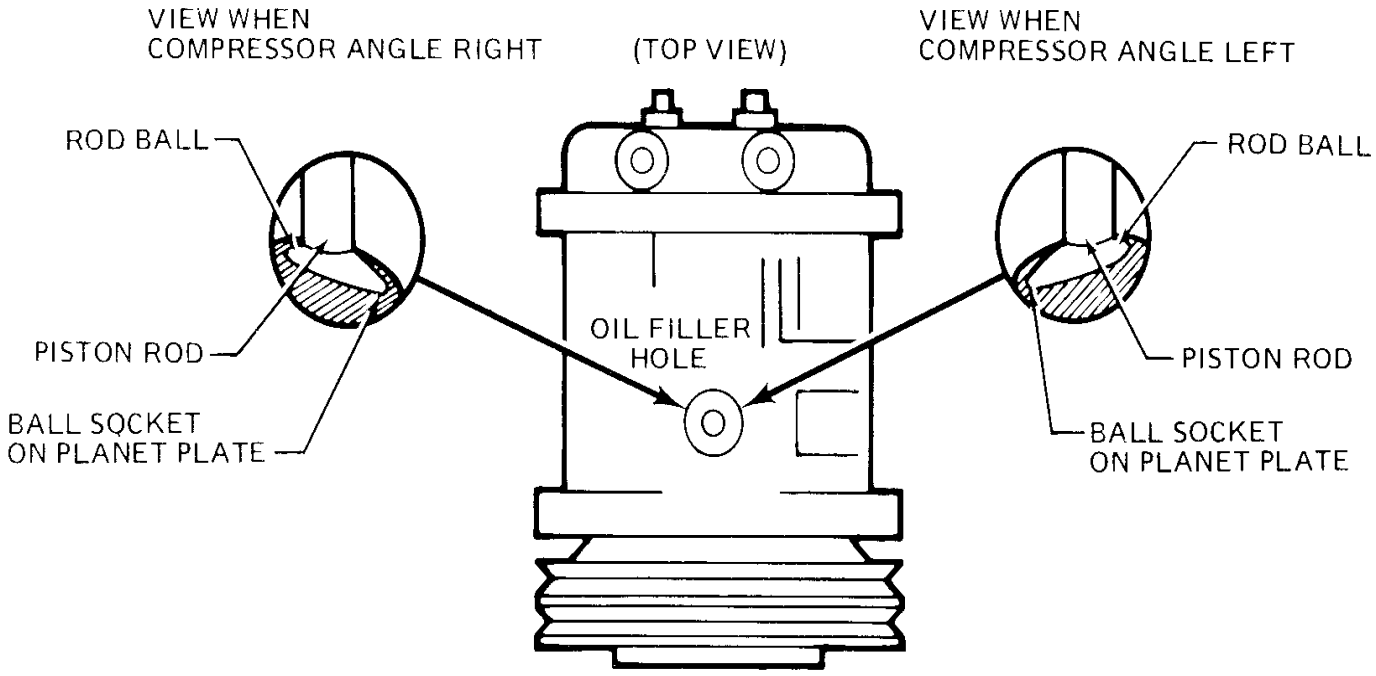
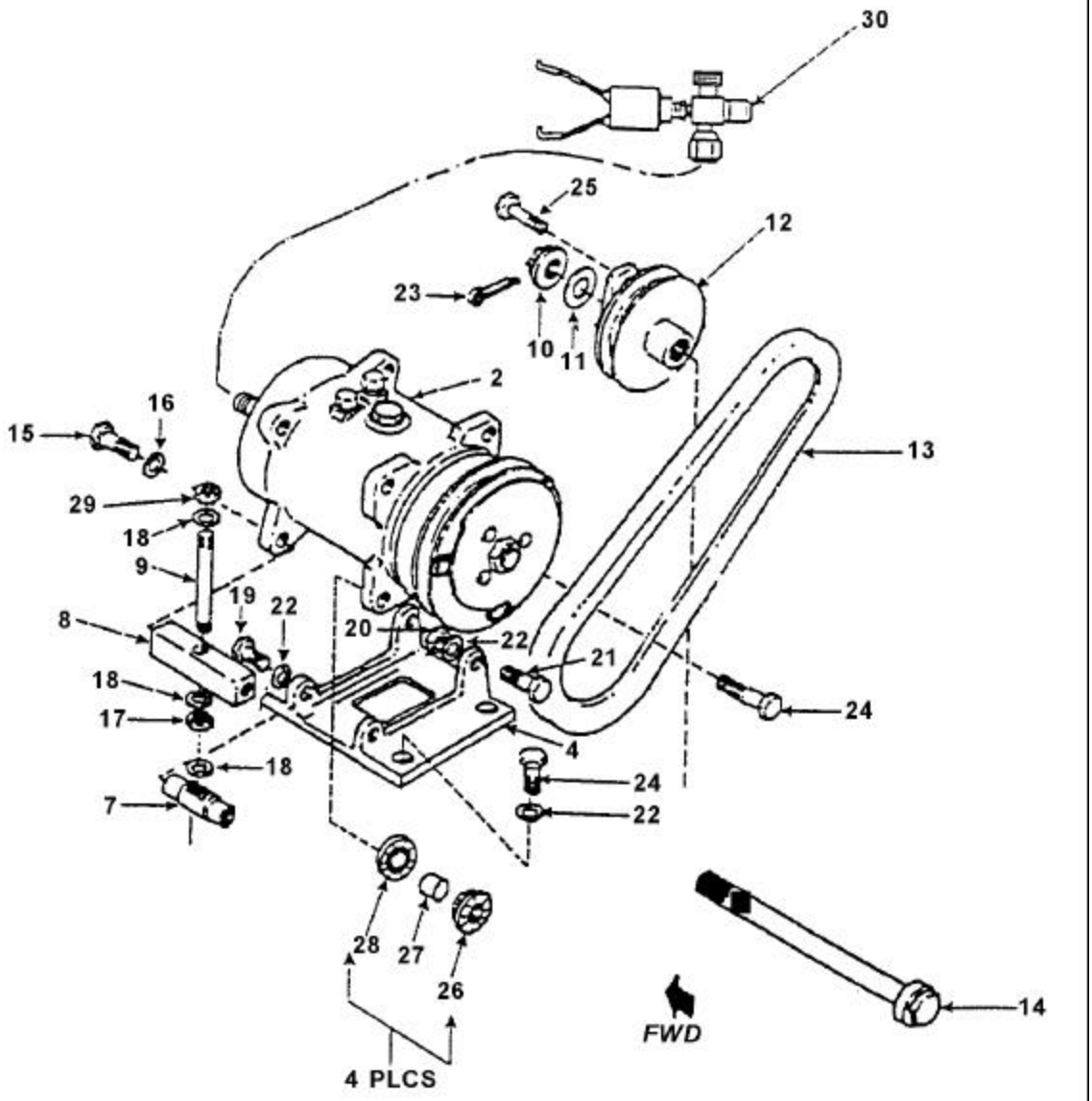


Figure 21-3. Compressor oil level check



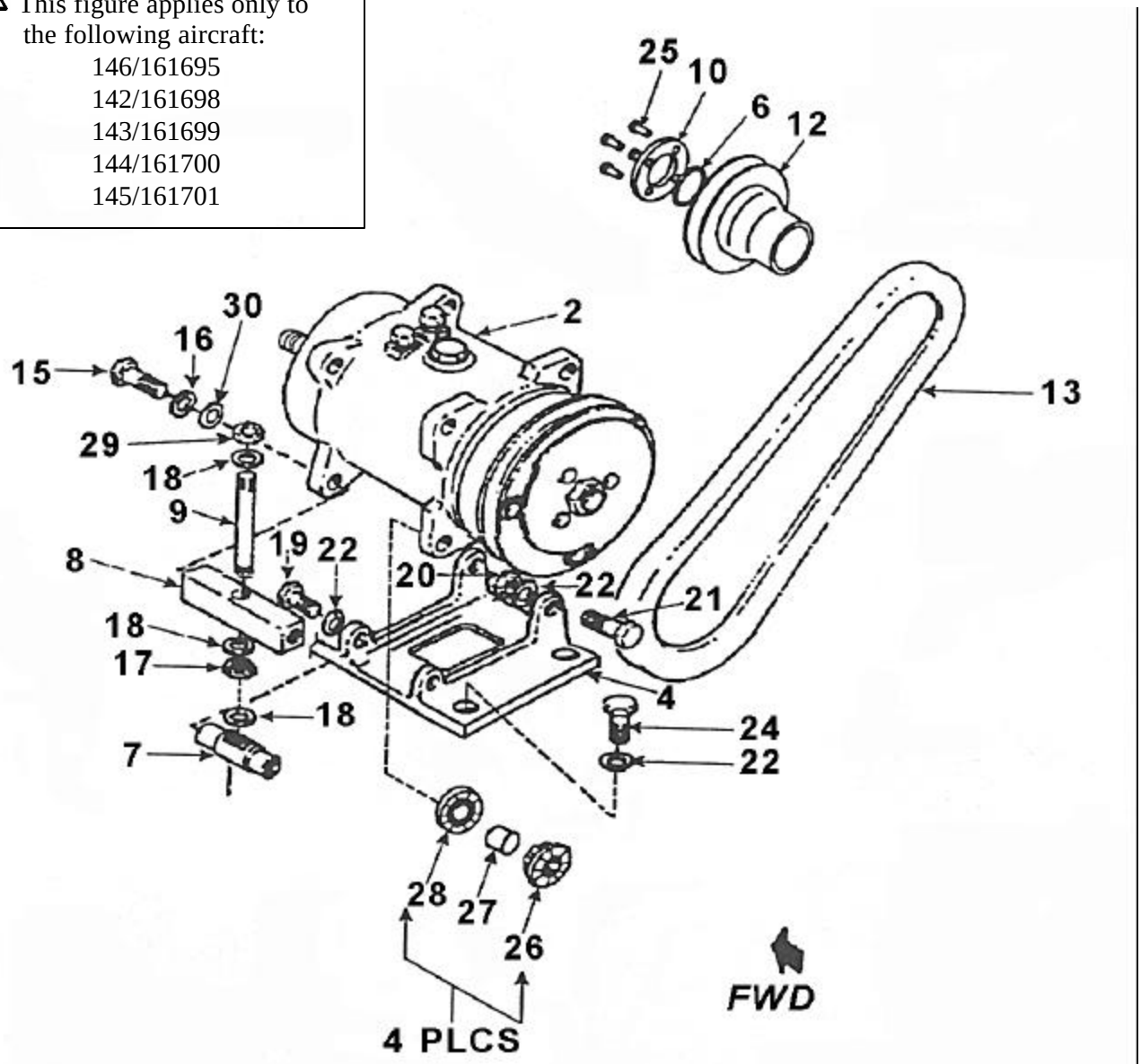
1. COMPRESSOR INST.
2. COMPRESSOR
4. COMPRESSOR MOUNT
7. ADJ. SUPPORT
8. ADJ. BRACKET
9. STUD
10. NUT
11. WASHER
12. ADAPTER PULLEY
13. BELT
14. BOLT
15. BOLT
16. WASHER
17. NUT
18. WASHER
19. BOLT
20. NUT
21. BOLT
22. WASHER
23. COTTER PIN
24. BOLT
25. BOLT
26. BUSHING
27. SPACER
28. BUSHING
29. NUT
30. PRESS. SWITCH/SERVICE VALVE

Figure 21-4. Compressor Assembly

NOTE

(1) This figure applies only to the following aircraft:

146/161695
142/161698
143/161699
144/161700
145/161701



1. COMPRESSOR INST.
2. COMPRESSOR
4. COMPRESSOR MOUNT
6. O-RING
7. ADJ. SUPPORT
8. ADJ. BRACKET
9. STUD
10. SPLINED INTERNAL RING
12. ADAPTER PULLEY
13. BELT
15. BOLT
16. WASHER
17. NUT
18. WASHER
19. BOLT
20. NUT
21. BOLT
22. WASHER
24. BOLT
25. SCREW
26. BUSHING
27. SPACER
28. BUSHING
29. NUT
30. WASHER
- SPANNER WRENCH

Figure 21-5 Compressor Assembly

21-6. SAFETY PRECAUTIONS.

The refrigerant used in the air conditioning system is R134a. This refrigerant is non-explosive, non-flammable, non-corrosive, has practically no odor, and is heavier than air. Although R134a is classified as a safe refrigerant, certain precautions must be observed to protect parts involved and the person working on the unit.

Liquid R134a, at normal atmospheric pressure and temperature, evaporates so quickly that it tends to freeze anything that it contacts. Care must be taken to prevent any liquid refrigerant from coming in contact with the skin and especially the eyes. R134a is readily absorbed by most types of oil, therefore, it is recommended that a bottle of clean mineral oil and weak solution of boric acid be kept nearby when servicing the refrigerant system. (See following WARNING.)

THE USE OF A FLAME-TYPE LEAK DETECTOR IS NOT ALLOWED. TO AVOID EXPLOSION, NEVER WELD, USE A BLOW TORCH, SOLDER, STEAM CLEAN OR BAKE AIRCRAFT FINISH. DO NOT USE EXCESS AMOUNTS OF HEAT ON, OR IN THE IMMEDIATE AREA OF ANY PART OF THE AIR CONDITIONING SYSTEM, OR REFRIGERANT SUPPLY TANK WHILE THEY ARE CLOSED TO ATMOSPHERE WITH REFRIGERANT OR NOT. ALTHOUGH R-134a GAS, UNDER NORMAL CONDITIONS IS NON-POISONOUS, THE DISCHARGE OF REFRIGERANT NEAR AN OPEN FLAME CAN PRODUCE A VERY POISONOUS GAS. THIS GAS WILL ALSO ATTACK ALL BRIGHT METAL SURFACES. THIS POISONOUS GAS IS ALSO GENERATED IN SMALL QUANTITIES WHEN A FLAME-TYPE LEAK DETECTOR IS USED.

ALWAYS WEAR SAFETY GOGGLES WHEN SERVICING ANY PART OF THE REFRIGERANT SYSTEM. SHOULD ANY LIQUID REFRIGERANT GET INTO THE EYES USE A FEW DROPS OF MINERAL OIL TO WASH EYES OUT, THEN USE A WEAK SOLUTION OF BORIC ACID TO WASH EYES, AND SEEK AID FROM A DOCTOR IMMEDIATELY EVEN THOUGH THE IRRITATION HAS CEASED.

The use of the electronic leak detector General Electric Model H-10 is recommended; however, if the H-10 is not available, leak detector Halogen Hawk TIF XP1 Automatic leak detector can be used to check each fitting, hose connection, and air conditioning component.

Since the refrigerant system is always under pressure, it is important to keep the system tightly sealed. When checking the system for leaks, allow system to operate for 10 to 15 minutes prior to checking.

21-7. COMPRESSOR ASSEMBLY

The compressor assembly is driven from the tail rotor drive shaft and is mounted in the engine compartment. The unit consists of a compressor, compressor mount, support hardware and a pressure switch. The compressor is driven via a single V flat belt, and compresses the refrigerant gas at which it will condense at ambient temperatures. This gas is directed to the condenser where its heat is removed by air flow from the condenser fan. A binary pressure switch monitors the refrigerant gas pressure. This switch will open at a condenser over pressure of 350 psi and under pressured conditions of 30 psi. This will interrupt the power to the compressor clutch and stop the compressor.

21-8. COMPRESSOR OIL LEVEL – SANKYO COMPRESSOR.

The compressor oil level should never be permitted to go below the minimum oil level of 6 ounces. If oil must be added, the oil level should not exceed 12 ounces. An excessive amount of oil is detrimental to the proper functioning of the entire system. The oil level must be checked prior to putting the system into operation at the beginning of each season.

If a compressor replacement is made on a system which has been in operation, the oil charge of the new compressor should not exceed 10 ounces.

When inserting the oil fill plug, the sealing packing is slipped over the oil fill plug threads in such a manner that the packing is not twisted. Insert the oil plug in the oil fill opening and tighten the plug snug. If the plug leaks, do not attempt to stop the leak by over tightening the oil check plug. A leak may be caused by dirt under the packing or on the seal, a fractured packing, or a damaged seat on the fill plug or oil fill opening. To stop leaks at the oil fill plug, correct the mechanical damages and insert a new packing.

21-9. CHECKING OIL LEVEL – KEITH JBS 212 COMPRESSOR.

When servicing the compressor or the system, make sure that the compressor has the correct amount of oil by using the following procedure:

1. Run the compressor for 10 minutes at engine idle RPM.

2. Evacuate all refrigerant from the system, being careful not to lose any oil. Refer to Para. 21-11.

3. Position the angle gage (tool no. 32448) across the flat surfaces of the two front mounting ears. After centering the bubble in the level-indicating portion of the angle gage, read the mounting angle of the compressor to the closest degree mark.

4. Remove the oil filter plug. Using figure 21-3 as a guide, and, while looking through the oil filter plug hole, rotate the clutch front plate to position the internal parts as shown.

NOTE

Procedures a. or b. are necessary to allow the dipstick to clear all internal compressor parts and be inserted to its full depth as shown in figure 21-6.

a. If the compressor mounting angle is to the right (facing pulley), center the parts as they are moving toward the rear of the compressor (discharge stroke).

b. If the compressor mounting angle is to the left (facing pulley), center the parts as they are moving toward the front of the compressor (Suction stroke).

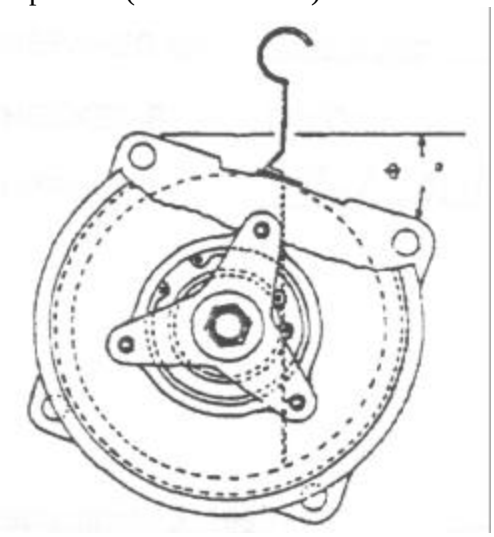


Figure 21-6. Compressor Dipstick

5. Insert the dipstick (tool no. 32447 J.B. Systems, Inc., P.O. Box 800, Longmont, CO 80501, Refer to Figure 21-9) all the way to its STOP position. This position is at the angle which appears near the top of the dipstick. The point of angle must be left if the mounting angle of the compressor is to the right, and the point of angle must be to the right if the mounting angle is to the left. In both cases, the bottom surface of the angle must be flush with the surface of the filler hole.

6. Remove the dipstick and count the number of increments of oil.

7. By using table 21-1 and the previously obtained information (mounting angle of the compressor and number of increments of oil), it can be determined if the oil level is correct or if oil must be added or removed.

8. If the increments read on the dipstick do not match with table 21-1, add or subtract oil to the midrange value. For example, if the mounting angle of the compressor is 10 and the increments read on the dipstick is 3, add oil until 7 is read on the dipstick. See figure 21-6.

Table 21-1.
COMPRESSOR MOUNTING ANGLE VERSUS OIL LEVEL INCREMENTS.

Mounting Angle (Degrees)	Compressor PIN: ES10505 JBS201 JBS215 JBS14026	Compressor PIN: ES 10507 JBS220 JBS221 JBS14116	Compressor PIN: ES10508
0	4-6	3-5	4-6
10	6-8	5-7	6-8
20	8-10	6-8	7-9
30	10-11	7-9	8-10
40	11-12	8-10	9-11
50	12-13	8-10	9-11
60	12-13	9-11	9-11

21-10. COMPRESSOR REFRIGERANT SERVICING.

A. EVACUATION AND CHARGING.

EQUIPMENT REQUIRED

ROBINAIR Model 34700 Recovery/Recycling/ Recharging Station

R-134a Refrigerant

B. RECOVERING REFRIGERANT

Recovered refrigerant passes through an oil separator and a filter-drier before entering the refrigerant tank. The moisture indicator turns green when dry refrigerant passes over it.

NOTE

Run the A/C system for a few minutes before starting the recovery process. Tests show more refrigerant is recovered if this action is taken. Turn the system off before proceeding.

WARNING

ALWAYS WEAR SAFETY GOGGLES WHEN WORKING WITH REFRIGERANT. USE ONLY AUTHORIZED REFILLABLE REFRIGERANT TANKS. READ AND FOLLOW ALL WARNINGS AT THE BEGINNING OF THIS MANUAL BEFORE OPERATING THE UNIT.

1. Attach the unit's red (high side) hose with the Quick Coupler to the high side fitting of the A/C system, then open the coupler valve. Figure 21-7.

2. Attach the unit's blue (low side) hose with the Quick Coupler to the low side fitting of the A/C system, then open the coupler valve.

3. Check the high side and low side gauges on the unit's control panel to be sure the A/C system has pressure in it before starting the recovery process. If there is no system pressure, there is no refrigerant in the system to recover.

4. Be sure the oil drain valve is closed.

5. Open both the high side and low side valves on the unit's control panel.

6. Open the red GAS (vapor) valve and the blue LIQUID valve on the tank.

7. **Slowly** open the oil drain valve to see if the oil separator contains oil. If it does, let the oil drain into the oil drain bottle (located at the bottom of the unit) until there is no more oil in the separator. Figure 21-10.

8. Close the oil drain valve. Be sure to dispose of the oil collected in the bottle in an appropriate manner, then return the bottle to its place on the unit.

9. Plug the unit into the proper voltage outlet, and turn on the MAIN POWER switch.

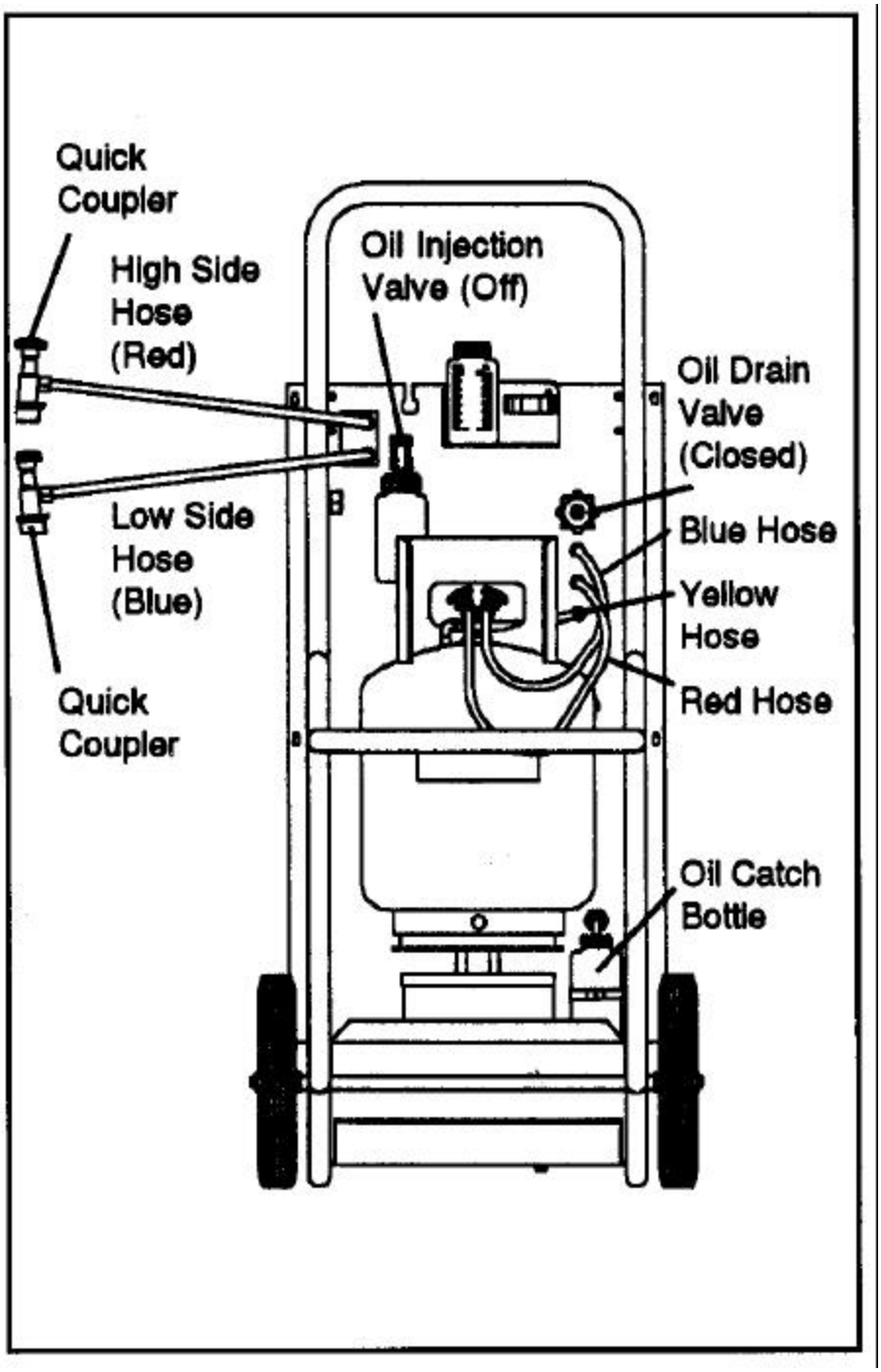


Figure 21-7. Diagram of Hose Connections

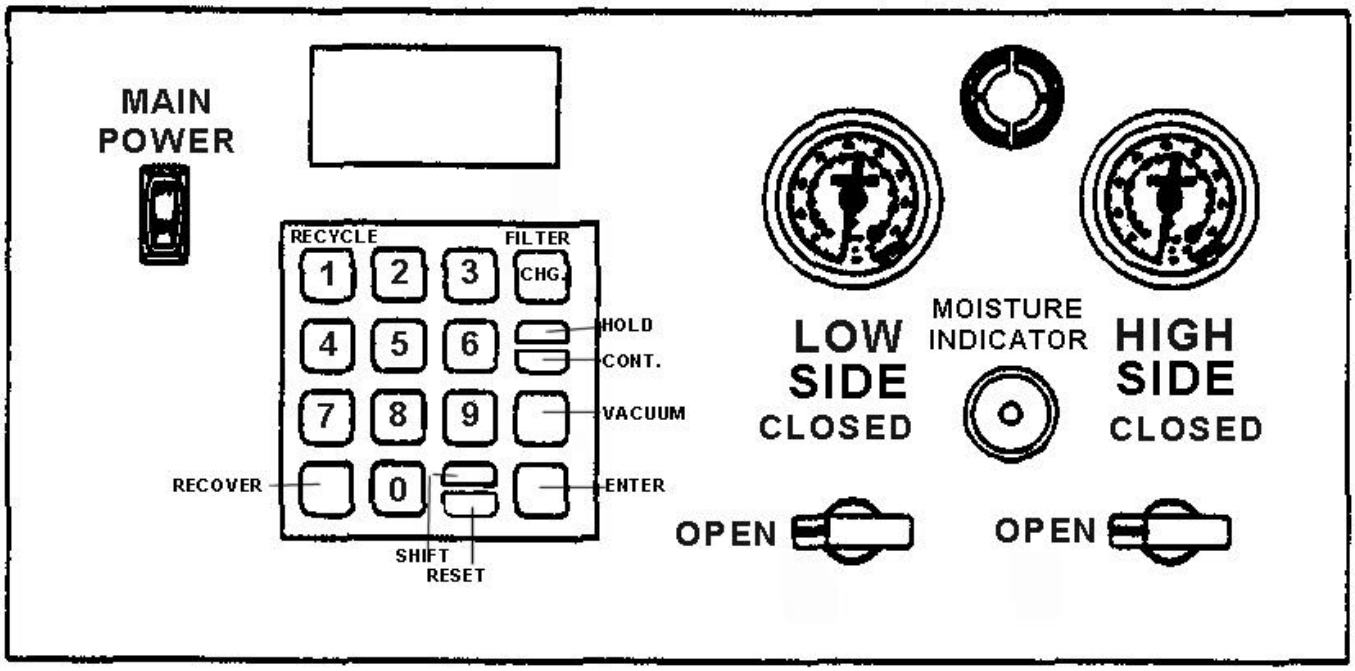


Figure 21-8. Diagram of Control Panel Valve Settings

NOTE

To increase the accuracy of the displayed recovery amount, a low side clearing routine is included in the recovery sequence. When you press the RECOVER key, the unit displays the message ""CL-L." This indicates that any refrigerant left in the unit's accumulator will be recovered into the tank. Recovery of refrigerant from the A/C system starts once a vacuum of 17 in. Hg is reached. The process takes from 20 seconds to four minutes to complete.

NOTE

Drain the oil separator after each job. The display will indicate "OIL(OUNCES)" or "OIL(GRAMS)" as a reminder.

10. Press the RECOVER key on the keypad.

NOTE

If A/C system pressure is low (near zero), the message "CH-P" appears on the display to alert you not to attempt recovery from an empty system. Do not press HOLD/CONT to continue the recovery process unless you know the A/C system contains refrigerant.

The display shows that the unit is in the RECOVER mode and the AUTOMATIC cycle. After the compressor starts, the display also shows the amount of refrigerant (in pounds or kilograms depending on the measurement mode selected) being recovered.

The compressor shuts off automatically when recovery is complete (at approximately 17 in. Hg), and the display shows the message "CPL" and flashes the amount (in pounds or kilograms depending on the measurement mode selected) of refrigerant recovered.

11. To assure complete recovery of refrigerant, wait for five (5) minutes and watch the manifold gauges for a rise in pressure above "0." If a rise occurs, press the HOLD/CONT key. Repeat as needed until the system pressure holds for two (2) minutes.

12. **Slowly** open the oil drain valve, and drain the oil into the oil catch bottle. When all the recovered oil has completely drained, close the valve.

THE OIL LOST FROM THE A/C SYSTEM DURING THE RECOVERY PROCESS MUST BE REPLACED WITH NEW OIL AS PART OF A/C SYSTEM RECHARGING. AFTER EACH REFRIGERANT RECOVERY PROCEDURE, MEASURE THE AMOUNT OF OIL IN THE OIL CATCH BOTTLE. ADD THE SAME AMOUNT OF NEW COMPRESSOR OIL TO THE SYSTEM, AS]DESCRIBED IN "REPLENISHING THE A/C SYSTEM OIL." BE SURE TO DISPOSE OF RECOVERED OIL IN AN APPROPRIATE MANNER.

13. To display the total amount of refrigerant recovered by the unit, simultaneously press the SHIFT/RESET and ENTER keys to enter the diagnostic mode. Then press "3." The control panel displays the total amount of refrigerant recovered in pounds or kilograms (depending on the measurement mode selected). The maximum amount displayed during recovery is 99 pounds (or 99 kilograms), although the maximum amount recorded is 9,999 pounds (or 9,999 kilograms) of refrigerant.

14. To clear the internal counter, simultaneously press the SHIFT/RESET and ENTER keys. To return to the Main Menu, press SHIFT/RESET.

C. EVACUATING THE A/C SYSTEM AND RECYCLING REFRIGERANT

EQUIPMENT REQUIRED

ROBINAIR Model 34700 Recovery/Recycling/ Recharging Station

R-134a Refrigerant

ALWAYS WEAR SAFETY GOGGLES WHEN WORKING WITH REFRIGERANT.

The Refrigerant Recovery/Recycling/ Recharging Station is UL-certified as a single-pass unit. During evacuation, however, refrigerant is automatically recycled to assure recharging with the cleanest possible refrigerant in no additional time.

NOTE

To be sure the unit tank has sufficient R-134a refrigerant for recharging, simultaneously press SHIFT/RESET and ENTER on the keypad to enter the diagnostic mode. Then press "6." The display must show 36 pounds (16 kilograms) or more because the empty weight of the tank is 28 pounds (13 kilograms) and about eight pounds (four kilograms) of refrigerant is required to assure a complete A/C system charge. If the amount displayed is less than 36 pounds (16 kilograms), add new refrigerant to the tank following the instructions in "Adding Refrigerant to the Tank."

1. With the high side and low side hoses connected to the A/C system, open both the red (high side) and blue (low side) valves on the unit's control panel.

2. Open both the red GAS (vapor) valve and the blue LIQUID valve on the tank.

To program the length of evacuation time, press the VACUUM key on the keypad. The display shows that the unit is in the VACUUM mode.

NOTE

For your convenience, a default vacuum time is preprogrammed to appear on the digital display at start-up. You can override this default setting by entering a different length of time in both minutes and seconds.

4. Enter the required time by pressing the appropriate number key or keys and then ENTER on the keypad. The display shows the time in minutes.

NOTE

Be sure to enter minutes and seconds when entering vacuum time. The leading digits (the digits entered for minutes) scroll off the display while you are entering them on the keypad. However, when you press ENTER to verify the programmed time, the correct length of time appears on the display. For example:

To program a vacuum time of ten minutes, you should press "1-0-0-0." As you enter these numbers on the keypad, the numbers "1" and the first "0" scroll off the display. Now press ENTER. The correct vacuum time of ten minutes (10:00) appears on the display.

To program a vacuum time of six minutes and 31 seconds, you should press "6-3-1." As you enter these numbers on the keypad, the number "6" scrolls off the display. Now press ENTER. The correct vacuum time of six minutes and 31 seconds (6:31) appears on the display.

5. Press the VACUUM key again to start the vacuum pump.

NOTE

If the vacuum pump has run for ten (10) or more hours without an oil change, the message "OIL" flashes on the display. Change the pump oil following the procedures outlined in the vacuum pump's operating manual. Then press the SHIFT/RESET key and the ENTER key to reset the oil change timer to zero. To override this feature, press CONT.

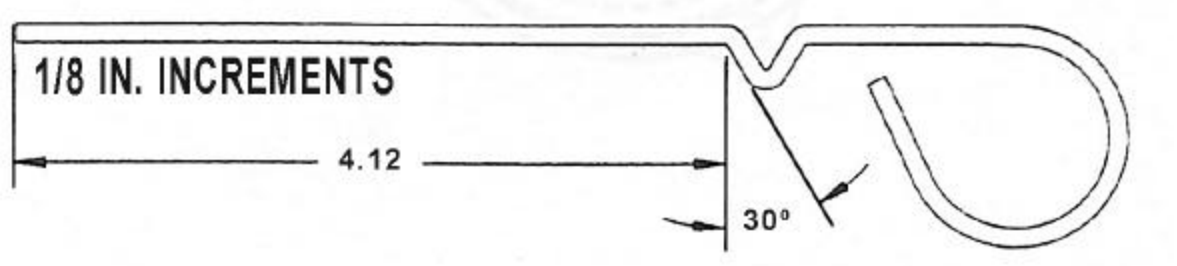


Figure 21-9. Compressor Oil Level Dipstick

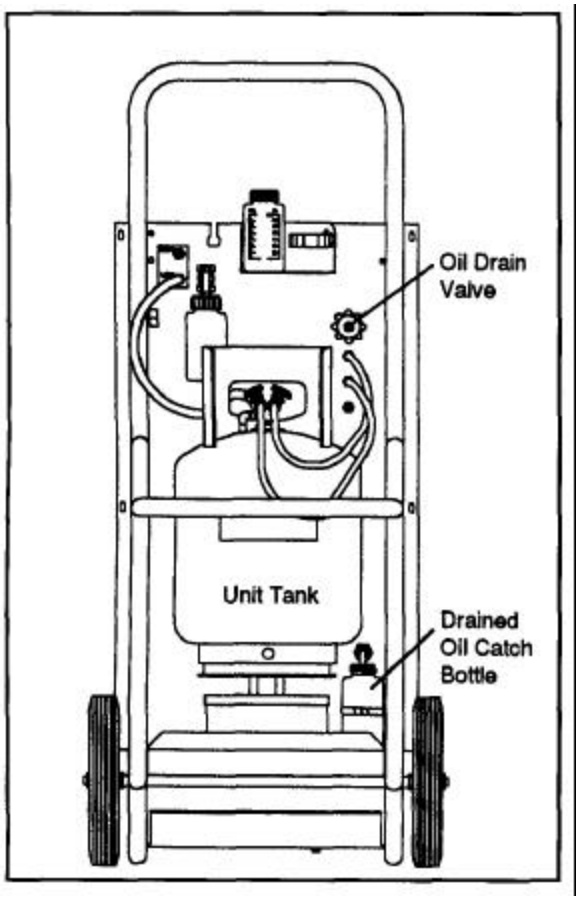


Figure 21-10. Diagram of Oil Drain Valve and Bottle

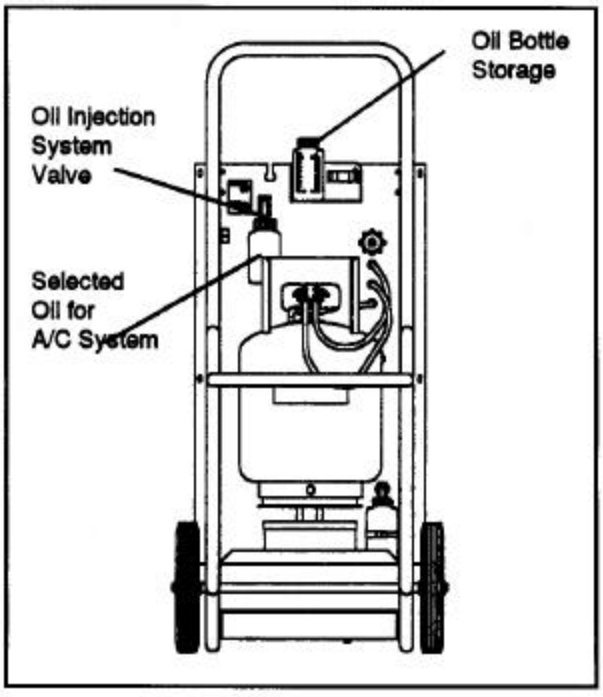


Figure 21-11. Diagram of Oil Injection System

The digital display counts down the remaining evacuation time in minutes and seconds. Recycling begins automatically five (5) seconds after the vacuum pump starts, and the "RECYCLE" message illuminates to indicate the unit is recycling refrigerant. Non-condensable gases (mostly air) are automatically vented from the tank during the recycling process, producing an audible pressure release. This is a normal function.

6. The vacuum sequence continues for the programmed length of time, then the digital display shows the message "CPL" to indicate that evacuation is complete.

If the moisture indicator is green, you may recharge with this refrigerant. If the moisture indicator has not turned green when the evacuation time is complete, the filter-drier is probably saturated with moisture and should be changed, as described in "Replacing the Filter-Drier."

NOTE

Pressing any key at this point lets you access the next function.

You can recycle refrigerant manually (without pulling a vacuum) in this mode for an indefinite period of time by simultaneously pressing the SHIFT/ RESET key and the RECYCLE key on the keypad. To cancel this operation, again press SHIFT/RESET.

If you require vacuum only, simultaneously press the SHIFT/RESET key and the ENTER key, then press "1" on the keypad. Run the vacuum pump as long as required, then press "1" or the SHIFT/ RESET key to cancel.

21-11. RECHARGING SYSTEM.

A. REPLENISHING THE A/C SYSTEM OIL

Before charging the A/C system, you must replenish any oil removed from the A/C system during the recovery process.

KEEP THE OIL BOTTLES TIGHTLY CAPPED AT ALL TIMES TO KEEP OUT MOISTURE AND CONTAMINATION.

1. Select the correct oil for the A/C system being serviced (refer to the system manufacturer's service manual).

TO PREVENT AIR FROM ENTERING THE A/C SYSTEM, NEVER LET THE OIL LEVEL DROP BELOW THE PICK UP TUBE WHILE CHARGING OR REPLENISHING.

2. Adjust the O-ring around the oil bottle to the required oil charge level.

For example, if the bottle's oil level is at four ounces and you need only one-half an ounce of oil to replenish the A/C system, then place the O-ring at the 3 1/2 ounce level.

3. Install the bottle on the oil injection system on the back of the unit.

NEVER OPEN THE OIL INJECTION VALVE WHILE THERE IS POSITIVE PRESSURE IN THE A/C SYSTEM. THIS COULD BLOW OIL BACK THROUGH THE BOTTLE VENT.

4. Open the oil injection valve at the top of the bottle, and watch the level of oil being drawn into the A/C system.

5. Close the valve when the required oil charge has been pulled into the system.

B. RECHARGING THE A/C SYSTEM

EQUIPMENT REQUIRED

ROBINAIR Model 34700 Recovery/Recycling/ Recharging Station

R-134a Refrigerant

Always wear safety goggles when working with refrigerant. Read and follow all warnings at the beginning of this manual before operating the unit.

Before charging you must evacuate the A/C system, following the instructions in "Evacuating the A/C System and Recycling Refrigerant." Be sure the LBS/KG selector switch on the back of the unit is set for the correct measurement mode (be sure to turn off the MAIN POWER switch before changing the measurement mode).

DO NOT PLACE ANY WEIGHT (INCLUDING YOUR HANDS AND FEET) ON THE TANK OR SCALE DURING THE REFRIGERANT TRANSFER PROCESS. ANY WEIGHT DISTURBANCE WILL CAUSE AN IN-CORRECT TRANSFER.

When recharging the A/C system, you can enter the amount of refrigerant to be recharged when you turn on the unit, and the unit stores this value in memory until you turn it off.

CHARGE ON THE LOW SIDE ONLY, OPEN THE LOW SIDE VALVE ON THE UNIT'S CONTROL PANEL.

1. If the messages "PROGRAM" and "CHARGE" do not display, press the CHG key to enter the PROGRAM mode.

2. Enter the amount of refrigerant required to re-charge the system by pressing the appropriate number keys and ENTER on the keypad.

3. Press the CHG key on the keypad to begin the charging process.

The digital display shows the message "AUTOMATIC" and shows the amount of refriger-ant you've programmed for recharge. You will hear the solenoid open, and the display will count down to zero. The message "CPL" displays when charg-ing is complete.

4. When charging is complete, close the high side valve. Both valves should now be closed.

NOTE

If the message "CH-P" appears, there is not sufficient refrigerant in the tank. Follow the instructions in "Adding Refrigerant to the Tank."

BE SURE THE HIGH SIDE AND LOW SIDE VALVES ON THE UNIT'S CONTROL PANEL ARE CLOSED BEFORE STARTING THE A/C SYSTEM.

5. Start the A/C system to pull the remainder of the charge into the system, and let it run until the gauge pressure readings stabilize (compare the gauge readings with the system manufacturer's specifications).

6. Check the evaporator outlet temperature to be sure that the A/C system is operating properly (refer to the system manufacturer's specifications for the proper temperature).

NOTE

For maximum charging accuracy, you must clear the hoses of all refrigerant.

DISCONNECT HOSES WITH EX-TREME CAUTION! ALL HOSES MAY CONTAIN LIQUID REFRIGERANT UNDER PRESSURE.

7. With the A/C system running, close the high side coupler valve, and disconnect the red high side hose from the A/C system.

8. Open both the red high side and blue low side valves on the unit's control panel. Refrigerant from both hoses will be drawn quickly into the A/C system through the blue low side hose.

Close the low side coupler valve, and disconnect the unit from the A/C system.

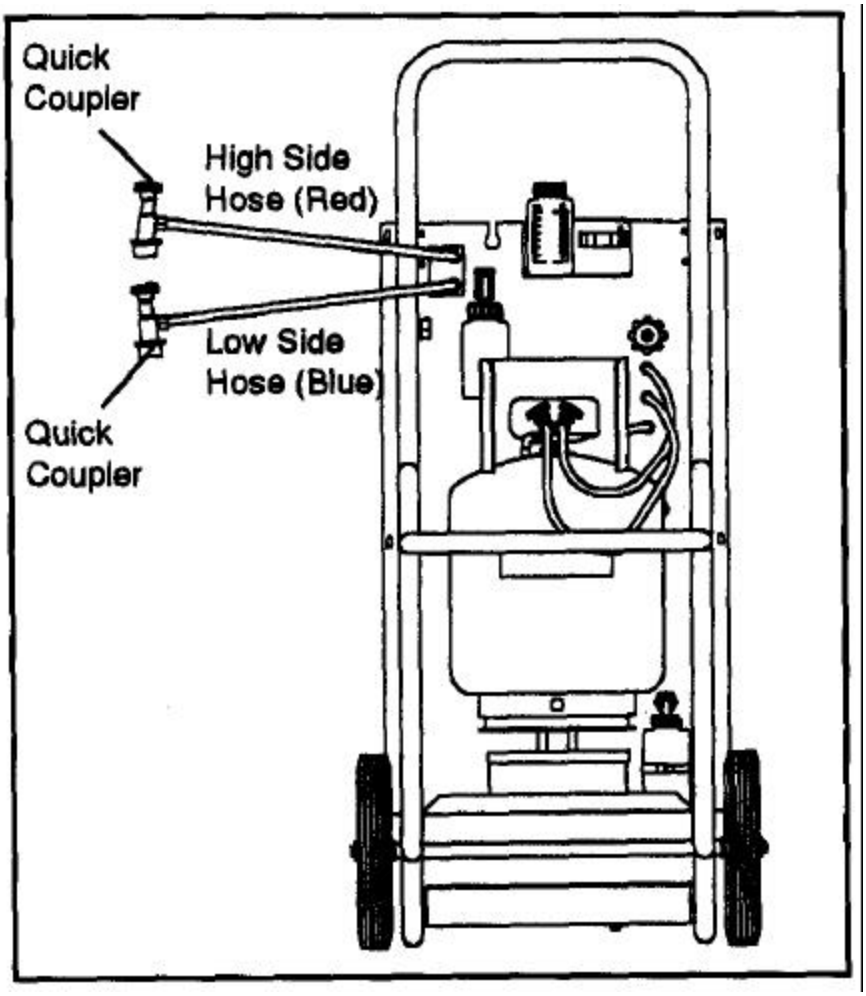


Figure 21-12. Diagram of Charging Connections

21-12. CORRECTING AN INCOMPLETE CHARGE

On rare occasions you may find that the total charge does not transfer to the A/C system. There are two reasons why this can occur:

1. The refrigerant transfer is too slow because the pressure in the unit tank and in the A/C system is about equal. When this happens, the unit emits an audible signal and the display shows the weight of refrigerant remaining to be transferred. To pull the remainder of the charge into the A/C system, you should:

   Close the high side valve.

   Open the low side valve.

   Start the A/C system, and press

   HOLD/CONT on the keypad.

2. The transfer will not complete and the display shows "CHECK REFRIGERANT" because there is not enough refrigerant in the tank to complete the process. You must then recover the partial refrigerant charge in the A/C system, add refrigerant to the tank, and complete another evacuation and charge procedure:

   a. Press HOLD/CONT on the keypad to interrupt the cycle.

   b. Press RESET to reset the unit.

   c. Recover the refrigerant that was charged into the A/C system, following the instructions in "Recovering Refrigerant. " Refer to Chap. 21-9.

   d. Add refrigerant to the tank, following the instructions in "Adding Refrigerant to the Tank. " Refer to Robinair Mod. 34700 Operating Manual.

   e. Evacuate the A/C system, following the instructions in "Evacuating the A/C System and Recycling Refrigerant." Refer to Para. 21-13.

   f. Recharge the A/C system. Refer to Para. 21-13.

21-13. REMOVAL – COMPRESSOR ASSEMBLY.

1. Open left and right side engine cowling.

2. Bleed pressure from air conditioning system, refer to paragraph 21-13 for procedure.

3. Loosen drive belt adjustment nuts (18 and 29, figure 21-4) until drive belt (8) can be removed from compressor.

4. Disconnect compressor electrical wires.

5. Disconnect compressor suction and discharge hoses from compressor. Cap open lines and ports.

6. Remove nuts (20), washers (16 and 22) and bolts (15 and 21). Remove compressor from compressor mounting bracket.

21-14. INSTALLATION – COMPRESSOR ASSEMBLY.

1. Position compressor (2, figure 21-3) to mounting bracket and install bolts (15 and 21), washers (16 and 22) and nuts (20).

2. Install drive belt over compressor pulley. Tighten adjustment nuts (17 and 29) until drive bet tension is 30 to 40 pounds. Lock adjustment nuts (17 and 29).

3. Connect compressor electrical wiring.

4. Connect suction and discharge hoses to compressor.

5. Evacuate and recharge system. Refer to paragraph 21-13.

21-15. REMOVAL - COMPRESSOR MOUNTING BRACKET.

1. Bleed pressure from air conditioning system. Refer to paragraph 21-13 for procedure.

2. Remove compressor assembly. Refer to paragraph 21-18.

3. Remove bolts (24, figure 21-4) and washers (22).

4. Remove bracket (21).

21-16. INSTALLATION – COMPRESSOR MOUNTING BRACKET.

1. Secure bracket (21, figure 21-4) to engine pan structure using bolts (24) and washer (22).

2. Install compressor assembly. Refer to paragraph 21-19.

3. Evacuate and recharge system. Refer to paragraph 21-13.

21-17. REMOVAL - COMPRESSOR DRIVE-SHAFT ADAPTER PULLEY.

1. Remove freewheeling unit to blower unit tail rotor driveshaft.

2. Remove aft end of tail rotor driveshaft from aft end of blower driveshaft.

3. Remove cotter pin, nut (10, figure 21-5), washer (11) and bolt (14). Remove adapter pulley (12).

NOTE

The subsequent instruction is limited to the following aircraft:

146/161695
142/161698
143/161699
144/161700
145/161701

4. Remove four (4) cap screws (25, Fig. 21-4) and splined retainer ring (10) from pulley. Install wrench P/N 206-1435-3 on oil cooler fan shaft. Using wrench, P/N APS363, hold pulley in place. With both wrenches installed, apply enough torque to remove the coupling.

21-18. INSTALLATION – DRIVESHAFT ADAPTER PULLEY.

1. Install adapter pulley (12, figure 21-4) on driveshaft splines. Install bolt (14) through blower driveshaft. Install washer (11) and nut (10). Torque nut (10) 60 to 100 inch pounds. Install cotter pin through nut (10).

2. Install aft end of tail rotor driveshaft. Refer to BHT-206A/B-Series-MM-1, Chap. 65.

3. Install freewheeling unit to blower unit driveshaft. Refer to BHT-206A/B-Series-MM-1, Chap. 65.

NOTE

The subsequent instructions are limited to the following aircraft:

146/161695
142/161698
143/161699
144/161700
145/161701

4. Install the MS28775-211 o-ring (6, Fig. 21-5) on the forward end of the oil cooler fan shaft assembly by coating the o-ring with anti-seize compound per MIL-A-907 and sliding over the splines into the recessed area on the aft side of the splines.

5. Coat the inside of the compressor drive pulley (12, Fig. 21-5) between the threads and the counter bore with anti-seize compound. Coat the matching area of the tail rotor drive shaft with anti-seize compound.

6. Install the compressor drive pulley (12, Fig 21-5) on the oil cooler fan shaft. Install wrench P/N 206-1435-3 on Bell Thomas coupling splined adapter, using existing hardware. Using spanner wrench P/N APS363, hold pulley in place. Slide Thomas coupling with wrench installed, over shaft and torque to 200 to 300 in/lb.

7. Install splined internal ring (10, Fig. 21-5) over the shaft and align holes to match holes of pulley.

NOTE

Pulley may be adjusted slightly to achieve alignment, maintaining 200 to 300 in/lb torque.

8. Install four cap screws (25, Fig. 21-5) in the splined ring and torque to 30 to 40 in/lb.

21-19. COMPRESSOR DRIVE BELT REMOVAL INSTALLATION AND ADJUSTMENT

1. Loosen the two compressor pivot bolts (15, Fig. 21-4).Loosen nut (29) and nut (17) securing the adjusting support.

2. Remove the short shaft assembly from between the free-wheeling output shaft and adapter pulley (12).

3. Loosen the four bolts (24) securing the compressor mount (4) to pallet and slide compressor (2) forward.

4. Remove old belt and install new belt (13).

5. Slide compressor mount (4) aft and align the adapter (12) and clutch (2) pulleys.

6. Tighten bolts (24) securing compressor mount.

7. Tighten nut (29) to tension belt. To tension belt:

   a. Adjust nut for moderate belt tension.

   b. Rotate tail rotor drive shaft through 2 revolutions.

   c. Tension belt to deflect 0.08 inch with a 2.4 - 3.2 lb. force applied at midspan location.

   d. Rotate belt 2 revolutions, retention as required to obtain proper deflection.

8. Tighten nut (17) securing the adjusting support.

9. Install short shaft assembly. Torque attach bolts to 70 in-Ibs.

21-20. AIR CONDITIONER BLOWER (AFT).

(3, Fig. 21-1)

21-21. REMOVAL – BLOWER ASSEMBLY (AFT).

1. Gain access to avionics shelf area.

2. Disconnect ducts from blower.

3. Disconnect wires from blower.

4. Remove bolts with washers.

5. Remove blower. Retain grommets.

21-22. INSTALLATION – BLOWER ASSEMBLY (AFT).

1. Position blower assembly with grommets underneath mounting brackets.

2. Install bolts with washers.

3. Connect ducts to blower.

4. Connect electrical wiring to blower terminals.

21-23. AIR CONDITIONER EVAPORATORS.

Refer to 1 and 2, Fig. 21-1.

21-24. REMOVAL – EVAPORATOR ASSEMBLY.

1. Remove aft seat back panels.

2. Remove avionics shelf partition.

3. Remove upper baggage compartment access panel.

4. Bleed pressure from air conditioning system, refer to paragraph 21-13.

5. Working through upper baggage compartment access opening, disconnect discharge and suction hose at “Y” fittings.

6. Disconnect electrical connectors from evaporator temperature sensors and freeze switch.

7. Disconnect air duct from aft side of evaporator.

8. Remove nuts, washers and bolts and remove evaporator assembly.

21-25. INSTALLATION – EVAPORATOR ASSEMBLY.

1. Position evaporator assembly in place and install bolts (5, figure 21-7), washers (6) and nuts (7).

2. Connect drain hose to evaporator assembly.

3. Connect air aft side of evaporator

4. Connect electrical connector to evaporator temperature sensors (9) and freeze switch.

5. Working through upper baggage compartment access opening, connect suction hose and discharge hose to “Y” fittings.

6. Evaporate and recharge air conditioning system, refer to paragraphs 21-10 (C) and 21-11 (B) for procedures.

7. Install upper baggage compartment access panel.

8. Install avionics shelf partition.

9. Install aft seat back panels.

21-26. AIR CONDITIONER CONDENSOR.

(4, Fig. 21-1)

21-27. REMOVAL OF BLOWER FROM AIRCRAFT

1. Disconnect the battery ground cable per Bell 206 Service Manual.

2. Loosen the screw clamps on each end of the blower housing.

3. Remove the blower mounting bolt that secures the ground wire ring terminal and loosen the three (3) remaining mounting bolts.

4. Rotate the blower to expose the positive lead wire.

5. Cut the lead wire, taking care to allow enough length to accept a wire splice on reinstallation. Also, secure the cut end of the lead that passes through the grommet in the side panel so it does not slip back through the opening.

6. Slide the blower forward and out.

21-28. INSTALLATION OF BLOWER INTO AIRCRAFT

1. Slide the blower aft through the loosened brackets and into the blower inlet duct opening.
2. Using a permanent wire splice, reconnect the blower positive lead wire to the positive wire protruding through the grommet in the side panel.
3. Push the positive lead back through the grommet while rotating the blower until the lead is hidden from view.
4. Reconnect the ground lead terminal by installing the appropriate blower mounting bolt. Tighten the remaining three (3) bolts as well.
5. Connect the forward outlet duct to the forward opening of the blower.
6. Tighten the two (2) screw clamps to secure the inlet and outlet ducts to either end of the blower housing.
7. Reconnect battery ground cable.

21-29. REMOVAL–CONDENSOR ASSEMBLY.

1. Remove aft access panel on baggage compartment.
2. Bleed pressure from air conditioning system, refer to paragraph 21-13 for procedure.
3. Remove lockwire and disconnect electrical plug from condenser blower motor.
4. Disconnect clamp from receiver/dryer discharge hose.
5. Disconnect receiver/dryer discharge hose at receiver bottle. Cap open lines and fittings.
6. Disconnect compressor discharge hose from condenser assembly. Cap open lines and fittings.
7. Remove six nuts, washers and bolts and remove condenser assembly.

21-30. INSTALLATION – CONDENSER ASSEMBLY.

1. Position condenser assembly in position and install six bolts, washers and nuts.
2. Connect compressor discharge hose to condenser coil fitting.
3. Connect receiver/dryer discharge hose to receiver/dryer fitting. Secure hose with clamp.
4. Connect electrical plug to condenser blower motor and lockwire.
5. Evacuate and recharge air conditioning system, refer to paragraphs 21-9 through 21-13 for procedures.
6. Install access panel.

21-31. RECEIVER/DRIER REPLACEMENT

1. Replace receiver/drier whenever the compressor is replaced or when the air conditioning system plumbing is left open to the atmosphere for a period of time greater than one (1) hour.

21-32. EXPANSION VALVE REMOVAL AND INSTALLATION

1. Discharge system in accordance with recovery equipments instructions.
2. Disconnect liquid line from inlet of expansion valve, and cap. Remove the thermal sense bulb from its clamp located on the suction tube of the evaporator and carefully remove insulation covering bulb.
3. Disconnect the fitting that connects the valve to the coil and plug coil fitting.
4. Install new expansion valve and o-ring (for o-ring fitting systems) in the reverse order.
5. Lubricate o-ring with polyol ester oil or apply sealant to fitting mating surfaces prior to assembly.
6. Install the thermal sense bulb such that it makes contact with the suction tube along its entire length. Insulate the bulb thoroughly with insulation.

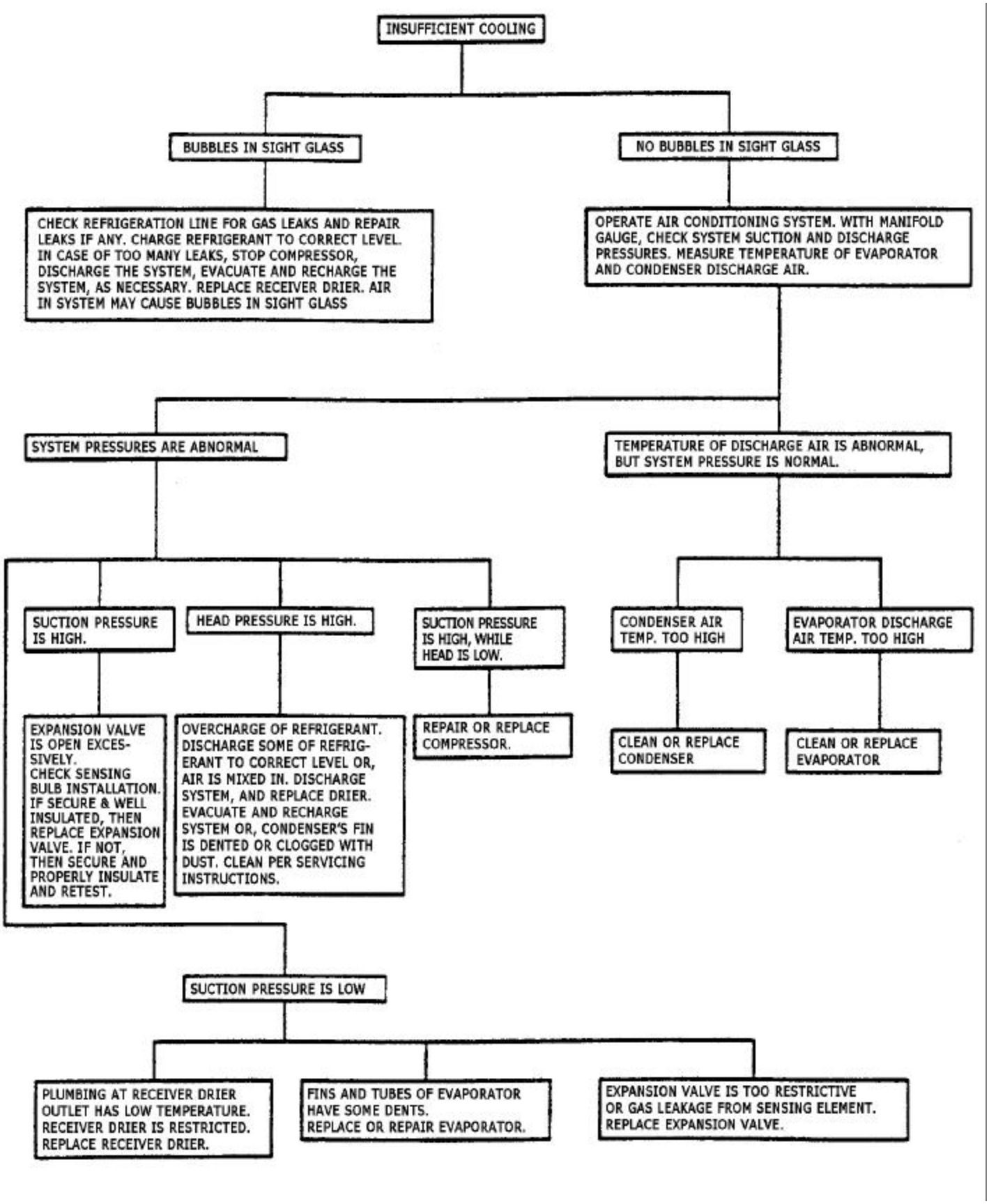


Figure 21-13. Air Conditioning System Diagnosis Chart

Table 21-3. TROUBLESHOOTING CHART

CONDITION	SERVICE PRESSURE GAUGE READING	PROBABLE CAUSE	CORRECTIVE ACTION
INSUFFICIENT REFRIGERANT CHARGE Insufficient cooling. Bubbles appear in sight glass.	SUCTION PRESSURE: below normal DISCHARGE PRESSURE: below normal	Refrigerant is low, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. Evacuate as necessary and recharge system.
ALMOST NO REFRIGERANT No cooling action. A lot of bubbles or something like mist appears in sight glass.	SUCTION PRESSURE: much below normal DISCHARGE PRESSURE: much below normal	Serious refrigerant leak.	Stop compressor immediately. 1. Leak test. 2. Discharge system. 3. Repair Leak(s). 4. Replace receiver drier, it necessary. 5. Check oil level. 6. Evacuate and recharge system.
FAULTY EXPANSION VALVE a) Slight cooling, Sweating or frosted expansion valve outlet. b) Insufficient cooling. Sweated suction line, c) No cooling. Sweating or frosted suction line.	a) SUCTION PRESSURE: below normal DISCHARGE PRESSURE: below normal b) SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal c) SUCTION PRESSURE: above normal DISCHARGE PRESSURE: below normal	a) Expansion valve restricts refrigerant. Or, expansion valve is clogged. Or, expansion valve is inoperative. Or, valve stuck closed. Thermal bulb has lost charge. b) Expansion valve allows too much refrigerant through evaporator. Sensing bulb on suction line not well insulated or properly attached to line. c) Faulty expansion valve.	a) Replace expansion valve. b) 1.Check valve for operation. If suction side does not show a pressure decrease, replace valve. 2. Check security and insulation on sensing bulb. c) i. Discharge system. 2. Replace valve. 3. Evacuate and replace system.

Table 21-3. TROUBLESHOOTING CHART. (Cont.)

CONDITION	SERVICE PRESSURE GAUGE READING	PROBABLE CAUSE	CORRECTIVE ACTION
AIR IN SYSTEM Insufficient cooling. Sight glass shows occasional bubbles.	SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows apprax 6 psi oscillation.	SUCTION PRESSURE: below normal DISCHARGE PRESSURE: above normal	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30 minute evacuating three times.) 4. Recharge system.
FAULTY CONDENSER Insufficient cooling. Bubbles appear in sight glass of drier. Suction line is very hot	SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal	Condenser air or refrigerant flow is restricted.	Check condenser for dirt accumulation. Check for refrigerant overcharge. If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.
HIGH PRESSURE LINE BLOCKED Insufficient cooling. Frosted high pressure liquid line.	SUCTION PRESSURE: much below normal DISCHARGE PRESSURE: much above normal	Drier clogged, or restriction in high pressure line.	1. Discharge system. 2. Remove receiver drier and replace it. 3. Evacuate and charge system.

Table 21-3. TROUBLESHOOTING CHART. (Cont.)

CONDITION	SERVICE PRESSURE GAUGE READING	PROBABLE CAUSE	CORRECTIVE ACTION
FAULTY COMPRESSOR Insufficient cooling.	SUCTION PRESSURE: much below normal DISCHARGE PRESSURE: much below normal	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.
TOO MUCH OIL IN SYSTEM (Excessive) Insufficient cooling.	SUCTION PRESSURE: above normal DISCHARGE PRESSURE: above normal	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to Oil Level Check for correcting oil level.

21-33. PLUMBING SYSTEM MAINTENANCE PROCEDURES

The following procedures are used to perform typical maintenance on the air conditioning system plumbing. Procedures are provided for hose or fitting replacement. New Keith Products air conditioning systems use swaged hose fittings.

Table 21-2. PLUMBING SYSTEMTOOLS AND EQUIPMENT

Designation	Ref. No.	Qty	Remarks
R134a Compatible Hose Swaging Kit	Available from Keith Products	1	None
Sharp Knife	Comm. Avail.	1	None
Impact Wrench	Comm. Avail.	1	None
Light Machine Oil	Comm. Avail.	A/R	None
Polyol Ester Oil	Comm. Avail.	A/R	Viscosity ISO 68
Sealant	ES49000-3	A/R	None

21-34. HOSE OR FITTING REPLACEMENT (Swaged Hose Fittings)

NOTE

If it is found that a hose or fitting has a leak, it will be necessary to replace the entire hose assembly.

Do NOT use Barb Loc fittings as replacement.

1. Hose should only be cut with a sharp knife. (**Note:** Use of serrated blades or saws to cut hose will leave particles that can contaminate system.)

2. Insert the proper size die in the swaging tool.
3. Insert fitting in swaging tool so that it is centered in the die and hand tighten.
4. Insert hose in fitting until it bottoms (**Note:** Indicating hole is in base of fitting).
5. Using impact wrench, tighten nut until die housings contact. (**Note:** It is important to keep hose pushed into fitting while swaging).
6. Reverse impact and back off nut until housing contacts rubber stops.

21-36. CONNECTION TO COMPONENTS O-RING REPLACEMENT

1. Place the appropriate o-ring over the tube 'O' end of the fitting.
2. Lubricate o-ring with polyol ester oil or sealant prior to assembly.
3. Apply sealant to all fitting mating surfaces prior to assembly.

21-37. CONNECTION TO COMPONENTS FLARED FITTINGS

1. Apply sealant to all fitting mating surfaces prior to assembly.

21-38. COIL CLEANING MAINTENANCE PRACTICES

The following procedure is used for cleaning either evaporator or condenser coils.

21-39. COIL CLEANING PROCEDURE

1. Use vacuum cleaner to remove large debris from upstream and downstream coil faces.
2. Spray coil cleaner on both coil faces. Wash off with water.
3. Allow coil to dry thoroughly prior to additional maintenance.

21-40. TROUBLESHOOTING

The procedures below present troubleshooting charts for the air conditioning system and the compressor. A diagnoses chart is presented for insufficient air conditioning system cooling. The performance characteristics of an aircraft's particular system is dependant upon the design parameters of the systems components. The performance of any one particular system varies with ambient temperature and humidity. The information below presents possible air conditioning system problems and solutions.

DO NOT OPERATE AIR CONDITIONING SYSTEM WITH CONDENSER AIR OUTLET BLOCKED.

21-41. AIR CONDITIONING SYSTEM DIAGNOSIS CHART

Figure 21-13 and Table 21-3 show a procedure for diagnosing air conditioning system problems. Following these procedures will expedite the troubleshooting process.

21-42. CHECKS

The following procedures are used to perform typical maintenance checks for air conditioning system refrigerant leaks, refrigerant charge and compressor oil level.

CAUTION!

DO NOT OPERATE AIR CONDITIONING SYSTEM WITH CONDENSER AIR OUTLET BLOCKED.

A. Tools and Equipment:

Table 21-4. Checks

Designation	Ref. No.	Qty	Remarks
Service Pressure Guage	Comm. Avail.	1	None
Oil Dipstick	Make from metal wire.	1	See Fig. 21-9
Electronic Leak Detector	Comm. Avail.	AIR	Type H-10G
Polyol Ester Oil	Comm. Avail.	A/R	Viscosity ISO 68

21-43. REFRIGERANT LEVEL CHECK

1. Select air conditioning system to ON.
2. Set the temperature selector (if so equipped) to the full cold position.
3. Set the blower speed to the maximum position.
4. Run system for five (5) minutes minimum.
5. Check that the receiver/drier inlet and outlet fitting temperatures are the same. If the outlet is colder, the receiver/drier screen is clogged. Clean screen and restart refrigerant level check.
6. F. Check sight glass for sufficient amount of bubbles.

NOTE

The refrigerant bubbles are more difficult to see at ambient temperatures below 65°F. Always re-check refrigerant level when ambient temperature is above 65°F for proper level.

21-44. BLEED AIR HEATER SYSTEM.

The bleed air heater system consists of two subsystems of bleed air and cabin/ventilating air. The cabin/ventilating air subsystem is shared with the freon air conditioning system. The bleed air heater consists of the following components: A control valve located on pilots overhead panel. The control knob on control valve is turned clockwise to turn heat on and counterclockwise to turn heat off. A regulator valve delivers bleed air as directed by the control valve to the ejector nozzle located within the heater silencer. The heater silencer is located above the access panel in baggage compartment. Bleed air delivered to the heater silencer nozzle creates a positive hot air flow to the cabin ducting. A duct temperature, when activated at 225° F, illuminates a segment on the annunciator panel labeled “DUCT TEMP HIGH.”

21-45. PRINCIPLES OF OPERATION – BLEED AIR HEATER.

The heating system consists of a bleed air heater assembly that is integrated into the aft evaporator air-distribution system and is pneumatically controlled. The heater assembly with flow regulator is located above the baggage compartment and just behind the passenger compartment. A knob on the pilot's overhead console controls the control valve that regulates bleed air flow through the flow regulator. A duct overheat light, located on the lower right hand instrument panel, illuminates in the event of a duct overtemp.

Bleed air from the engine flowing thru a restrictor is supplied to the regulator valve. The regulator valve poppet is held closed by the spring. A very small flow of air passes through an orifice in the regulator valve to the dome covering the regulator valve diaphragm. As long as the spring tension in the pilot valve is low, dome pressure passes out the vent.

When spring tension is increased in the pilot valve, which is done manually by turning the control knob of the valve, pressure builds in the regulator valve dome proportional to that spring force and the diaphragm forces the poppet valve open. Bleed air flows through the regulator seat and forces the diaphragm to close the regulator. Therefore, air pressure to the ejector nozzle is proportional to the pilot valve spring tension. Bleed air flow through the nozzle increases with increasing pressure and more heat is supplied to the cabin.

This section of the maintenance manual describes the heating system and presents heating system troubleshooting and maintenance practices procedures. An Illustrated Parts List is included in Figure 21-1.

21-46. TROUBLE SHOOTING PROCEDURES – BLEED AIR HEATING SYSTEM.

Perform troubleshooting for each component in the heater system in accordance with Table 21-5.

21-47. HEATER SILENCER ASSEMBLY.

A. REMOVAL – HEATER SILENCER ASSEMBLY

1. Gain access to heater silencer assembly by removing hat shelf partition. Open baggage compartment door and remove upper access panel.
2. Disconnect electrical connectors from temperature sensor (16, Figure 21-14).
3. Disconnect ducts (14 and 17) by removing clamps (13 and 18).
4. Disconnect duct (11) by removing lower clamp (10).
5. Open twist locks (12) to allow clamps to open. Remove heater silencer (15).

B. INSTALLATION – HEATER SILENCER ASSEMBLY.

1. Position heater silencer (15, Figure 21-10) in place and secure with clamps and twist locks (12).
2. Connect duct (10) using lower clamps (10).
3. Connect ducts (14 and 17) using clamps (13 and 18).
4. Connect electrical connectors to temperature sensor (16).

21-48. PRESSURE REGULATOR VALVE.

A. REMOVAL – PRESSURE REGULATOR VALVE.

1. Disconnect upper end of duct (11, Figure 21-14) by loosening upper clamp (10).
2. Disconnect bleed air tube assembly (2) at elbow (7).
3. Loosen nut (5) and unscrew pressure regulator valve (8). Discard packing (6).

B. INSTALLATION – PRESSURE REGULATOR VALVE.

1. If installing replacement valve, install elbows (7 and 9, Figure 21-14) in pressure regulator valve (8).
2. Install new packing (6) on union (4) below nut (5).
3. Install pressure regulator valve (8) on bulkhead union (4) and tighten nut (5).
4. Connect and tighten tube assembly (2).
5. Install duct (11) on elbow (9) and secure with upper clamp (10).

Table 21-5. BLEED AIR HEATER SYSTEM TROUBLESHOOTING

INDICATOR OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1. No bleed air to regulator valve.	a. Loose or ruptured bleed air line	(1) Check for loose fittings (2) Replace lines.
2. No bleed air flow thru regulator valve.	a. No air to pilot valve.	(1) Check lines and fittings to pilot valve.
	b. Orifice in regulator plugged	(1) Replace regulator.
	c. Diaphragm ruptured.	(1) Replace regulator.
	d. Seal damaged or dirt in pilot valve.	(1) Ground run helicopter or connect shop air line to regulator inlet and test by holding finger over pilot valve vent. If this causes regulator to open, replace pilot valve.
3. Insufficient heater flow	a. Flow restrictors installed backwards.	(1) Check to see that long taper is downstream from engine.
	b. Pilot valve faulty.	(1) Ground run helicopter or connect shop air line to regulator inlet and test pilot valve by holding finger over pilot valve vent. If heater flow increases replace pilot valve.
4. Regulator will not shut off.	a. Dirt in regulator seat.	(1) Remove regulator valve cover and clean chamber, poppet, spring and seat in accordance with 100 hour inspection.
	b. Line to valve plugged or damaged.	(1) Disconnect valve line at regulator valve. If regulator valve closes check line for blocking; if regulator valves fails to close, replace regulator valve.
	c. Pilot valve faulty	(1) Disconnect line at pilot valve, if regulator valve closes, replace pilot valve.
5. DUCT TEMP HIGH light illuminated.	a. Defective temperature sensor	(1) Replace temperature sensor.
	b. Blockage in duct.	(1) Clean dirt.

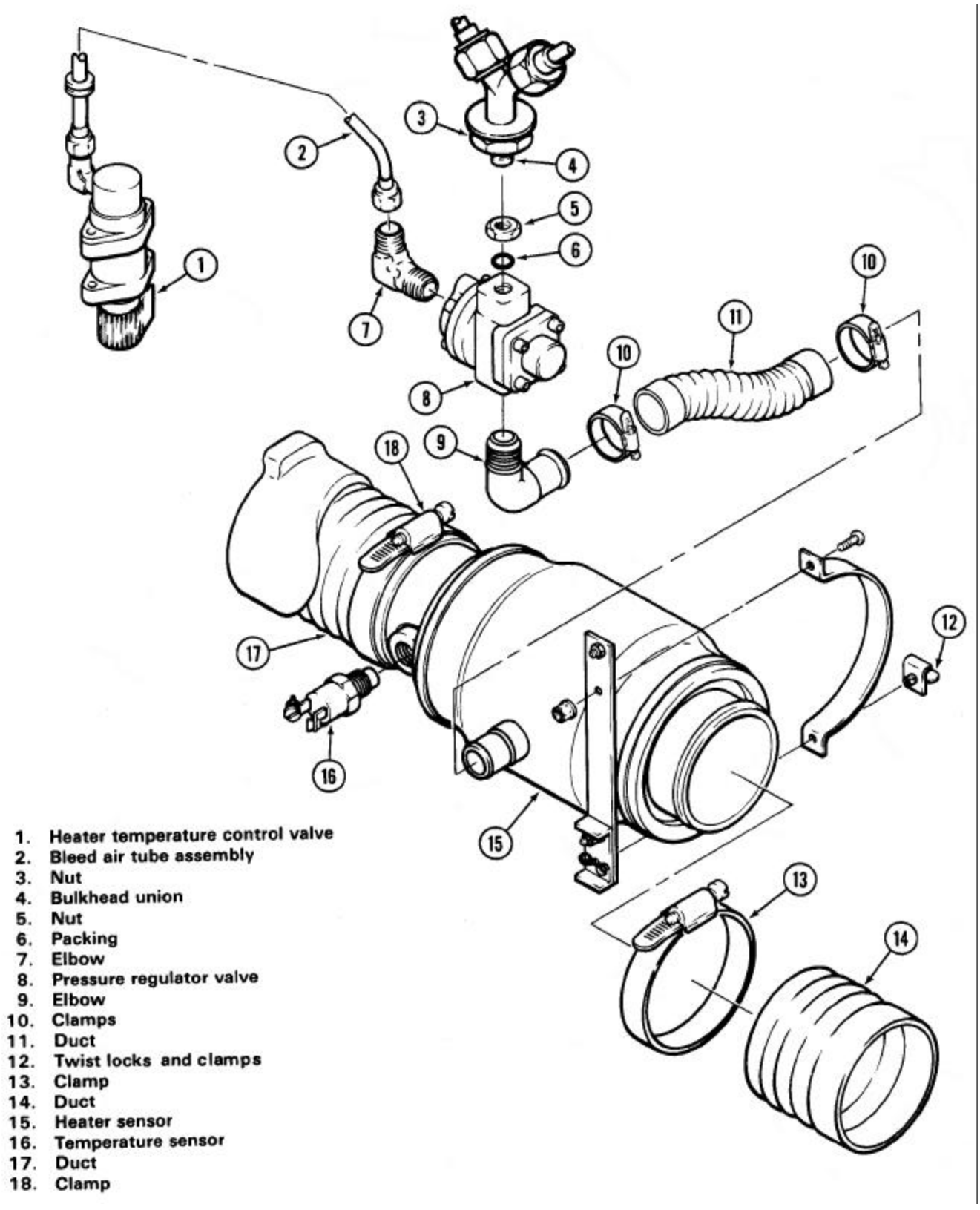


Figure 21-14. Bleed Air Heater Installation